

GTE Laboratories Incorporated

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LABS:95:119

September 13, 1995

Advanced Research Projects Agency (ARPA)  
Contracts Management Office (CMO)  
3701 North Fairfax Drive  
Arlington, VA 22203-1714

Attention: Mr. Douglas M. Pollock

Subject: Contract No. MDA972-93-C-0057; GTEL Project No. 852  
Quarterly R&D Status Report (SLIN 0002AA)

Dear Mr. Pollock:

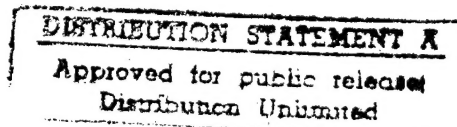
GTE Laboratories Incorporated hereby submits the subject report covering the period May 23, 1995 through August 23, 1995, in accordance with the terms of the Contract.

If you should have any questions or require any additional information or further clarification, please contact me at (617)466-2954.

Sincerely,

Deidre B. Ryan  
Contracts Manager

Enclosure



cc: ARPA/DSO  
Attn: Dr. Bertram Hui  
3701 N. Fairfax Drive  
Arlington, VA 22203-1714  
(1 copy)

ARPA/DSO  
Attn: ADPM (Claire Ricaurte)  
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bcc: H. Kim  
R. Klein

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**Sponsored by**  
**Advanced Research Project Agency**  
**Defense Sciences Office**  
**METHODS AND COMPONENTS FOR OPTICAL**  
**CONTENTION RESOLUTION IN HIGH SPEED NETWORKS**

**ARPA Order No. 9339**  
**Program Code No. 2V10**  
**Issued by ARPA/CMO under Contract #MDA972-93-C-0057**

Period: May 23, 1995-August 23,1995

Submitted by:  
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Dr. H. Kim, Program Manager  
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# QUARTERLY R&D STATUS REPORT

## Description of Progress:

During the eighth quarter of the CORD project most of the CRO module related work has been performed at Stanford University with GTE Laboratories involvement. The CRO contains LiNbO<sub>3</sub> optical switches which have switching characteristics dependent on the polarization of the optical signal. Therefore, any drift in polarization has drastic effects on the extinction ratio, or cross-talk, of the switch. The 100 m single mode fiber delay line, the 50 m polarization maintaining fiber (PMF) delay line and the switches themselves were all sources of polarization instability.

Recently, a demo unit from Hewlett Packard of the HP8509B Polarization Analyzer has allowed us to achieve a much better insight into all of these polarization instability phenomena. As for the 100 single-mode delay-line, its polarization instability seems to be of intrinsic nature. It is possible that it could be reduced to some extent by coiling the fiber around a larger-diameter drum, but the procedure holds no guarantee of success. We also performed numerous experiments with the PMF delay lines and concluded that either the connectors or the v-groove splices were not correctly aligned to the core of the PMF. The only way to correct for this problem was to have the PMF delay lines re-connectorized. The new results show a 5 to 10 dB extinction ratio improvement, together with a substantially better stability in time.

The University of Massachusetts group focused its efforts on development of CRO architectures and control strategies to guarantee FIFO packet reception, i.e., packets in the CRO are received according to their arrival times. Also completed were the first phase of evaluation of CRO scalability to a number of wavelengths and stages larger than 2. Completed was the debugging phase of the software modules necessary to emulate reconfigurable optical devices and timed operations of optical devices (e.g., switching time). Initiated was a study to implement a user friendly graphical interface for the specification of the optical network layout of the communications system to be simulated with the CONSIP simulator.

The progress in development of the digital optical switch at GTE Laboratories includes reduction of waveguide propagation losses through redesign of the fanout bends and degree of confinement. The losses in waveguide bends were reduced to below .5 dB. In the next phase of this work the fanout sections and switch structure will be combined together.

GTE Laboratories milestones: status

1. Fabrication of a digital optical switch with extinction ratio  $>20$  dB.

Feasibility of low loss curved fanout waveguides have been demonstrated. Fabrication of X and Y switches are underway utilizing the new design.

2. Optimization of switch design for high speed operation.

Delayed till full completion of milestone 1.

# GTE Laboratories Incorporated

## Project 852 Program Financial Status @ 31-Jul-95

<u>Work Breakdown</u>	<u>Cumulative-To-Date</u>			<u>At-Completion (1)</u>		<u>Remarks</u>
	<u>Planned Expend</u>	<u>Actual Expend</u>	<u>% Com- pleted</u>	<u>BAC (2)</u>	<u>LRE (3)</u>	
Current Work Plan	\$369,787	\$275,220	74%	\$431,418	\$431,418	
Sub Total	<u>\$369,787</u>	<u>\$275,220</u>	<u>74%</u>	<u>\$431,418</u>	<u>\$431,418</u>	
Management Reserve	\$0	\$0	0%	\$0	\$0	
Sub Total	<u>\$0</u>	<u>\$0</u>	<u>0%</u>	<u>\$0</u>	<u>\$0</u>	
Unallocated Resources	\$0	\$0	0%	\$0	\$0	
Sub Total	<u>\$0</u>	<u>\$0</u>	<u>0%</u>	<u>\$0</u>	<u>\$0</u>	
TOTAL	<u>\$369,787</u>	<u>\$275,220</u>	<u>74%</u>	<u>\$431,418</u>	<u>\$431,418</u>	

(1) Period-of-Performance is 8/18/93 - 12/31/95 (28 Months)

(2) Budget-At-Completion

(3) Latest Revised Estimate